

Decentralized Stormwater Management: Retrofitting Homes, Restoring Watersheds

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Stormwater runoff from impervious surfaces in urban and suburban areas has led to human safety risks and widespread stream ecosystem impairment. While centralized stormwater management can minimize large fluctuations in stream flows and flooding risk to urban areas, this approach does not address the ecological requirements of maintaining variation in stream flow that is recognized as necessary for healthy aquatic ecosystems. In contrast, decentralized stormwater management, which distributes stormwater infiltration and retention devices throughout watersheds, should more effectively mimic pre-development stream flow patterns. However, decentralized stormwater management requires a great deal of coordination between landowners and municipal authorities, posing legal, social, economic, hydrologic, and ecological challenges and constraints. Thus, we are using a multidisciplinary approach to test the effectiveness of decentralized best management practices (BMPs) at mitigating stormwater runoff in the Shepherd Creek watershed, a 1.8 km² residential and forested watershed in Cincinnati, Ohio (USA). Two types of BMPs will be evaluated, rain barrels and rain gardens, because of their potential for mitigating stormwater runoff from roofs and driveways. A voluntary auction will be used to allocate BMPs. This voluntary, market-based approach is expected to ensure economic efficiency while avoiding potential legal constraints regarding landowners' private property rights. The results of the auction will allow us to evaluate homeowners' willingness to accept BMPs on their property in exchange for financial compensation. We have also implemented a comprehensive monitoring program to identify how watershed processes might be affected by BMP implementation. The hydrologic and ecologic responses to retrofit stormwater BMPs will be tested using a before-after-control-treatment experimental design, in which the treatment is the installation of rain barrels and rain gardens. This research will be used to evaluate the viability of an auction approach to retrofit homes with stormwater BMPs and, in turn, restore stream ecosystem health.

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